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(54) Plant shoes for inhibiting weed growth

(57) A plant shoe, for covering the area around a young tree or other plant to inhibit weed growth, is of the kind comprising a thin, opaque web (10) with a central hole (11) for the plant stem (13) and a transverse slit (17) through which the stem is slipped to position the shoe. The web has channels (16, 20) for collecting water falling on the top surface. The water is distributed over the area below the shoe through small holes (19) and/or delivered to the base of the plant stem itself. To ensure satisfactory water flow the web is stiffened by ribs which also form the sides of the channels.

FIG. 1

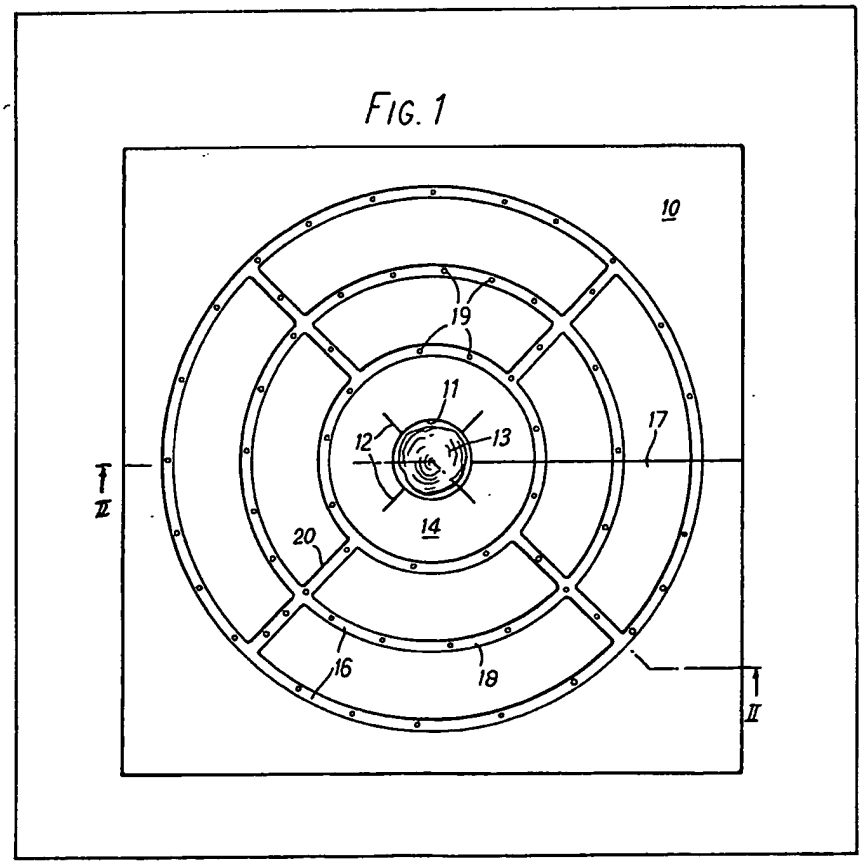

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FIG. 1

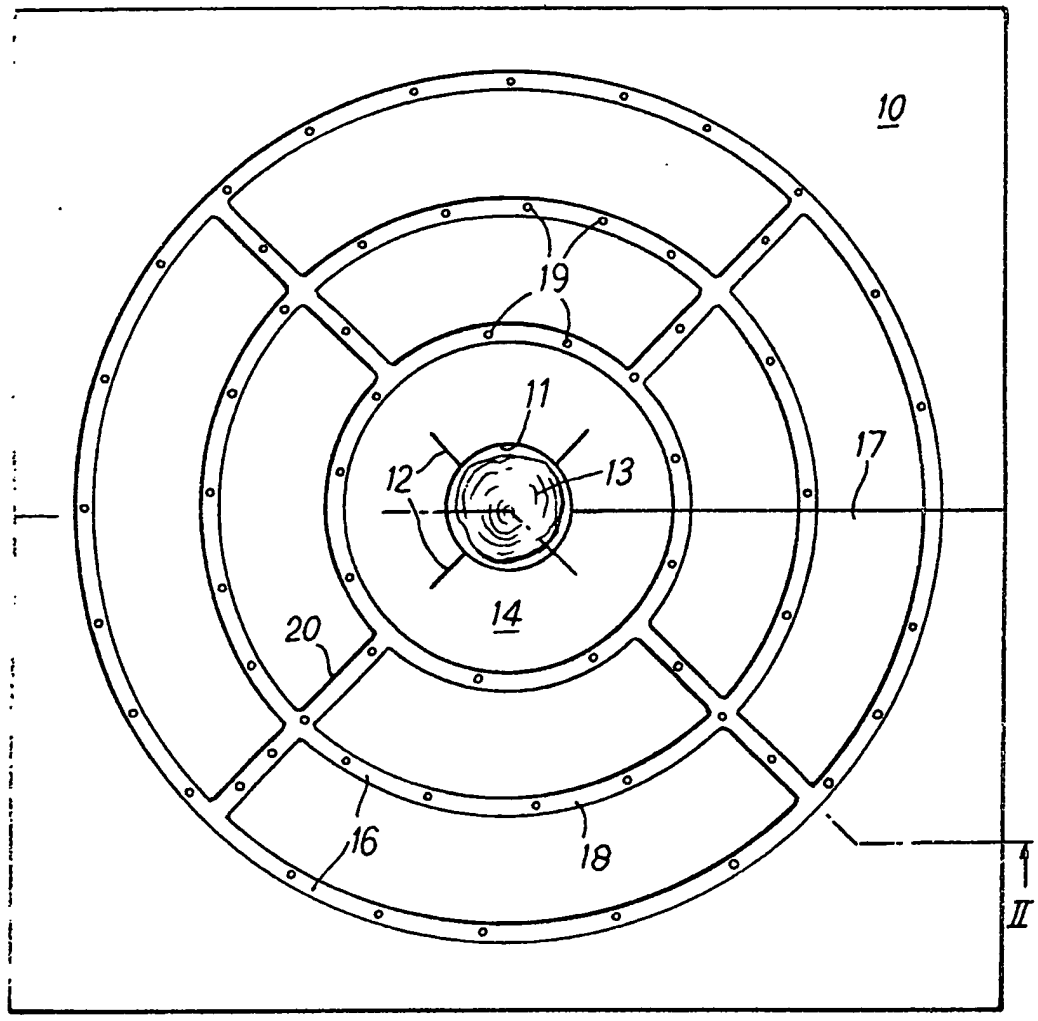

FIG. 2

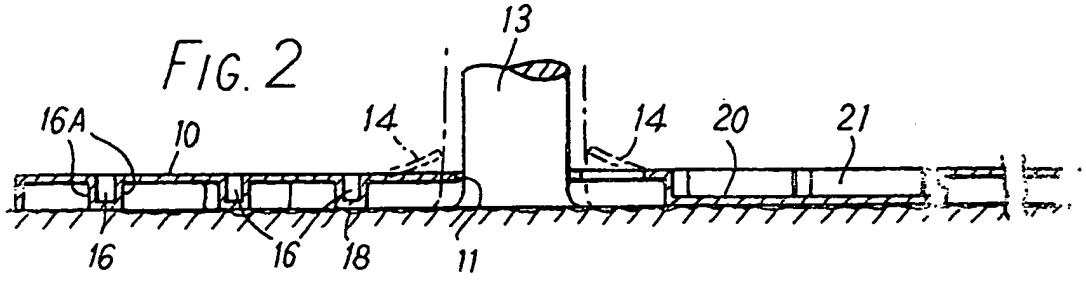

FIG. 3

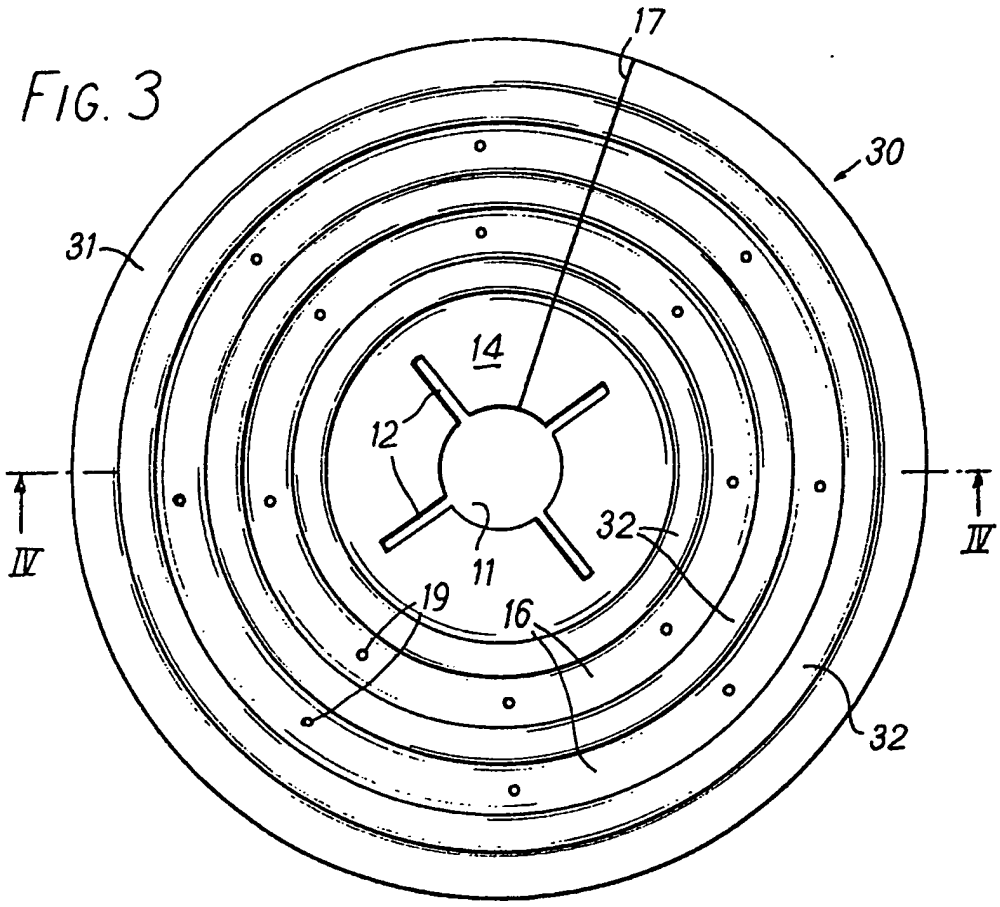

FIG. 4

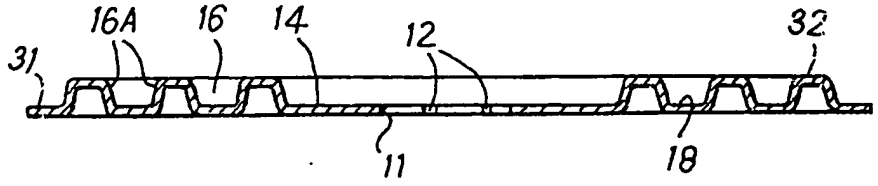

FIG. 5

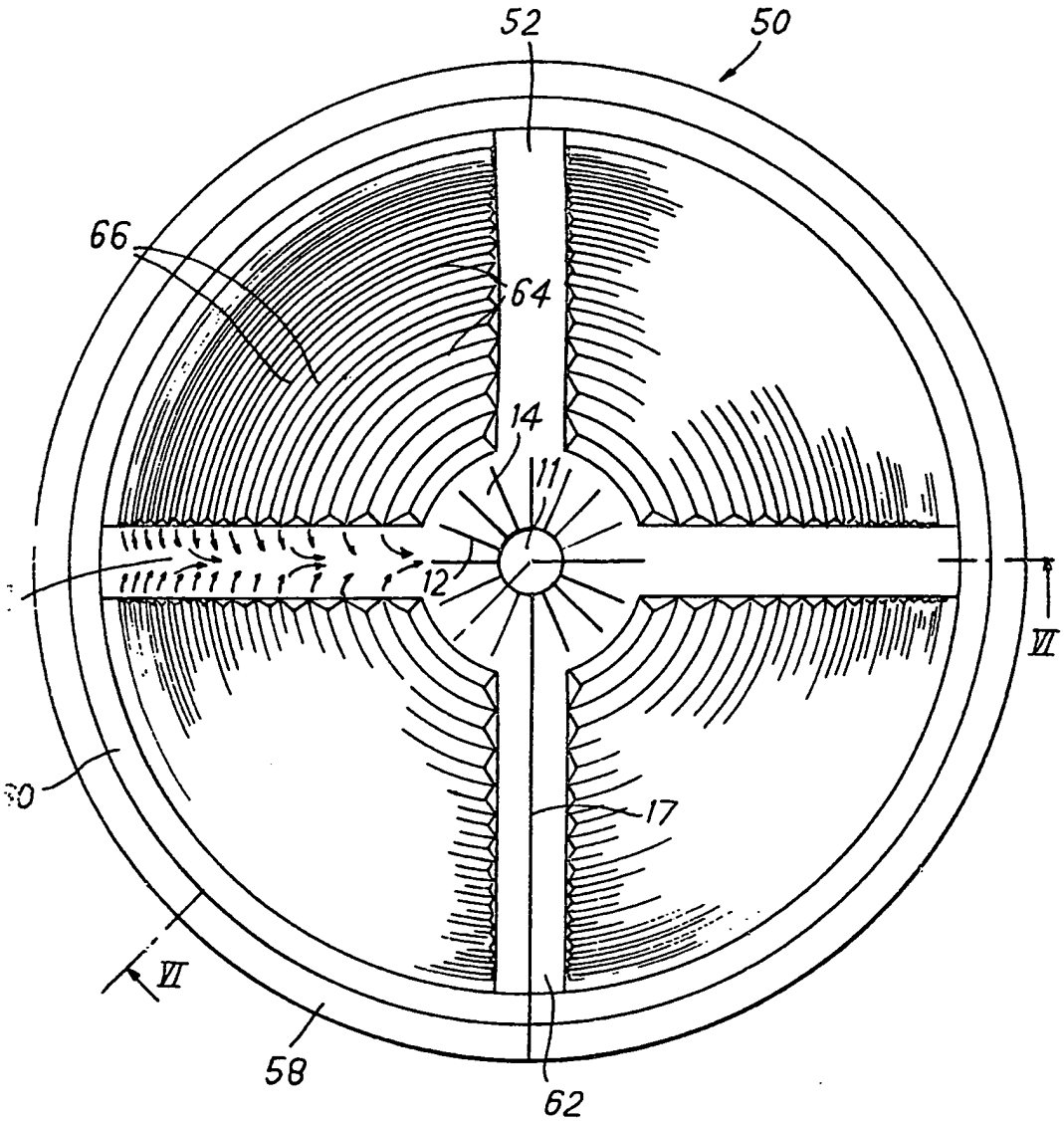

FIG. 6

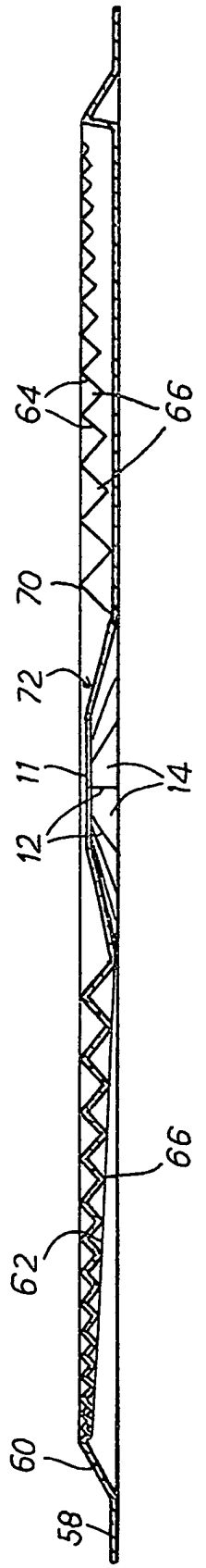

FIG. 7

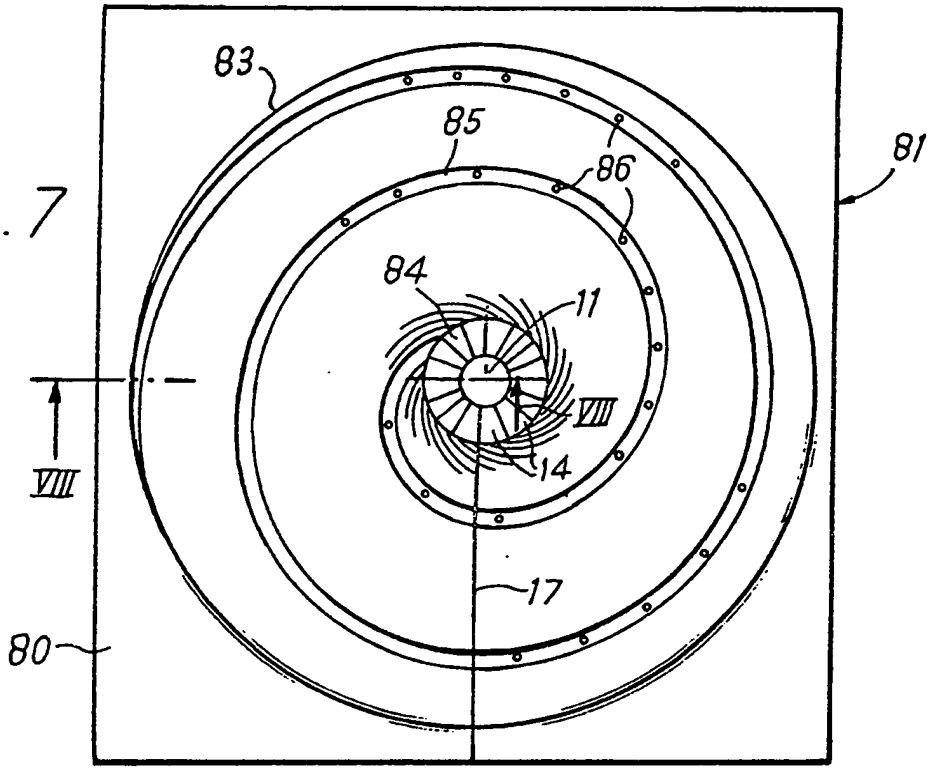

FIG. 8

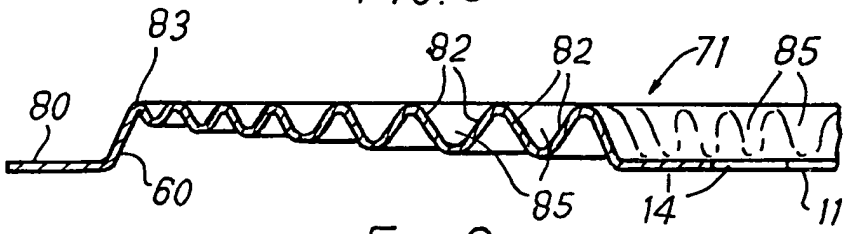

FIG. 9

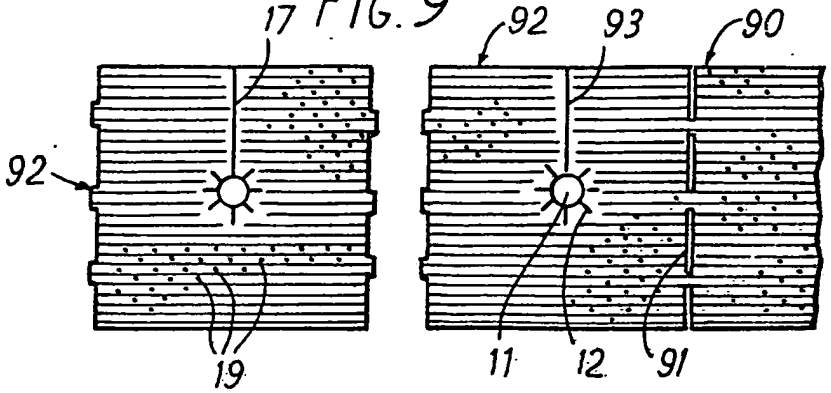

Figure 5 is a plan view of a plant shoe in a third embodiment;

Figure 6 is a sectional elevation on the line VI-VI in Figure 5;

Figure 7 is a simplified plan view of a plant shoe in a fourth embodiment;

Figure 8 is an enlarged sectional elevation on the line VIII-VIII in Figure 7; and

Figure 9 is a plan view of a plant shoe in a fifth embodiment in which the shoe is cut from a roll. Figure 9 also shows part of the roll.

Referring to Figures 1 and 2, the plant shoe shown comprises a square web or plate member 10 thermoformed of thin, opaque plastics material having a substantially central hole 11 with radial slits 12 extending from the hole 11 so that when the trunk 13 of a tree protrudes through the hole, the flaps 14 between the slits 12 can flex and lie against the trunk, shown in phantom lines in Figure 2, if or when the trunk is of larger diameter than the hole 11. The hole 11 is joined to the periphery of the web by a slit 15.

Concentrically with the hole 11, the web 10 has a number of circular channels 16 whose walls are downwardly-extending, integral ribs 16A. The floor 18 of each channel is perforated by small drain holes 19. The channels 16 are interconnected by radial channels 20 defined by walls in the form of similar but straight ribs 21.

The ribs 16A, 21 impart considerable stiffness to the web 10, but are yet such that the edges of the slit 17 can be easily separated to allow them to be slipped past the trunk 13 whilst the plant shoe is being positioned around the latter in known manner. It will also be realised that the flexibility of the flaps 14 is not affected by the ribs.

In use, rainwater, or water from a hose or sprinkler, falling on the upper surface of the web 10 will not collect thereon, due to the comparative stiffness of the web, but runs into the channels 16, 20 whence it drains through the holes 19, so distributing the water over the area covered by the shoe.

The holes 19 are made large enough to permit drainage, but not so large as to encourage weed growth, through the holes. Thus the plant shoe prevents growth of weeds around the tree by denying light to the soil below the shoe, but still ensures distribution thereto of water collected on the shoe.

The plant shoe 30 shown in Figures 3 and 4 comprises a circular web 31, but is otherwise generally similar to the shoe shown in Figures 1 and 2, expect that radial channels are absent and the width of each of the channels is equal to that of the lands 32 joining the upper ends of the channels. The greater part of the web 31 is thus of corrugated form.

Instead of the holes 19, there may alternatively be provided small slits, providing only that they are sufficiently small to discourage weed growth therethrough whilst allowing water to drain through them.

During watering, an even distribution of moisture to the roots of the tree or plant is achieved by the regular arrangement of the perforation 30; and since the size of the perforations is small relative to the overall area of the plate, evaporation is discouraged.

Turning to Figures 5 and 6 which show a plant shoe 50, the latter comprises a circular plastics web 52 formed with a central hole 11 and a radial slit 17 for allowing the shoe to be fitted about the stem or trunk of a plant.

The web 52 includes a flat annular rim 58 defining a base plane of the plate, and a raised annular shoulder 60 adjacent to the rim 58. Four equally-spaced, radially-extending surfaces 62 slope downwardly from the shoulder 60 towards the base plane towards the hole 11. The portions of the web lying between the surfaces 62 are quadrants of the web, corrugated to define a series of arcuate first channels 66, each open at both ends so that water falling on the corrugated quadrants runs along the channels 66 to spill into the radial second channels defined by the surfaces 62, down which the collected water runs towards the hole 11, which it enters via the radial slits 12 which are arranged around the latter and which serve the same purpose as described above with reference to Figures 1 and 2. In this way the water is all passed to the base of the stem of the plant protected by the plant shoe.

The depth of each arcuate channel 66 is smaller than that of the next one adjacent to it in a radially-inward direction, as shown in Figure 6, so that the tops of the ribs 64, which constitute the corrugations of the web, lie substantially in a common horizontal plane 70, whilst the bottom of each channel 66 is at the level at which it joins the adjacent radial channels.

As indicated at 72 in Figure 6, the flaps 14 between the radial slits 12 are formed into a shallow frustrum of a cone in this embodiment. They may however, if desired, be planar; though the frusto-conical arrangemment does facilitate upward deformation of the flaps 14 when necessary due to the plant stem being of greater diameter than the central hole 11.

Referring to Figures 7 and 8, the plant shoe 81 shown therein is generally similar to that of Figures 5 and 6, except that it is square, having in place of the circular rim 58 a flat peripheral flange portion 80; the flaps 14 are shown in a co-planar condition instead of in frustro-conical orientation; and the arrangement of the ribs and channels is different. The shoe 81 has its web formed with a circular area which is corrugated in spiral form, the corrugations comprising pairs of spiral ribs 82 defining between the ribs of each pair of spiral channel 85 extending from the outer edge 83 of the corrugated area to the central area 84 which constitutes the means enabling a plant stem to protrude through the shoe and which includes the hole 11 and flaps 14. In Figure 7, only one of a plurality of the spiral channels 85 is shown, for simplicity. As shown in Figure 8, the channels 85 terminate in the central area 84 in even spacing around the latter, thus delivering water to the centre substantially evenly around the circumference of the central area. The depth of the ribs 82, and therefore of each spiral channel 85, increases gradually from the outer edge 83 to the outlet of the channel, as can be seen from Figure 8, so that water collecting on the corrugated area is carried by the channels 85 direct to the central area 84.

The channels 85, and also the arcuate channels 64

SPECIFICATION

Plant shoes for inhibiting weed growth

This invention concerns plant shoes. The term "plant shoe" is to be understood to mean a member, in the form of a plate or sheet, which is adapted to lie on the ground so that the stem of a plant can protrude upwards through an opening in the member. The term "plant" includes a tree, or a shrub, or any plant having a stem or stems extending generally upwardly out of the ground.

The main purpose of a plant shoe is to prevent light from reaching the ground, and so inhibit the growth of weeds, in the immediate vicinity of a plant, particularly whilst the plant is young and/or after planting or transplanting, at which time it is at its most vunerable from established root systems in the vicinity and from the effect of weeds taking from the soil moisture and nutrients needed by the roots of the plant which is establishing itself and subsequently growing.

A plant shoe also has other useful functions; for example it helps keep the soil around the plant moist, by reducing evaporation and encouraging condensation on the underside of the shoe. In cold weather it helps to keep the roots of the plant at acceptable temperatures by shielding the soil surface from the wind and providing a measure of insulation against ground frost.

Various kinds of plant shoes are known or have been proposed, the simpliest being sheets or strips of opaque plastics film, usually black or green. This is commonly used by strawberry growers around their plants. Such film, however, is prone to being lifted by the wind, and also (since it is subject to folding and wrinkling) may adversely affect the distribution of moisture to the plant during watering.

Another simple type of plant shoe is in the form of a cardboard sheet having a central opening for receiving the stem or trunk of a plant. A slit extending from the opening to an edge of the sheet enables the sheet to be deformed to provide a passage by which the stem or trunk of the plant may be inserted into the opening. Disadvantages of this plant shoe are its tendency to distort and curl up at the edges, so reducing both its efficiency and its ability to permit a ready supply of moisture to the plant.

Another kind of plant shoe that has been proposed consists of a pair of chevron-shaped flexible mats which are placed in opposed relationship on the ground either side of the stem of the plant, with one mat overlapping the other so that the stem protrudes through a diamond-shaped opening formed at the apices of the two re-entrant sides of the mats.

Yet another type of plant shoe, described in United Kingdom patent specifications Nos. 1 284 768 and 1 381 679, consists of a disc of synthetic plastics or other flexible material having a hole in the middle, or alternatively a set of diagonal cuts which meet at the centre and define between them triangular flaps which, when the shoe is placed around the stem of the plant, lie vertically against the stem. This type of shoe, like the simple cardboard plate mentioned above, has a slit extending from the centre to the edge, to enable the shoe to be placed around the plant stem. A commercially-available version of this shoe is in the form of a square, which may be anchored to the ground by spreading soil on the corners.

All of the types of plant shoe so far described are designed to lie flat on the ground. Some require careful shaping of the soil surface around the plant, e.g. so that it slopes gently away from the stem all around the latter. The shoe is usually flexible so that it conforms fairly accurately with the contours of the soil surface, with which it is in contact over all or most of the area covered. Whilst the soil under the shoe may attract moisture through drainage from surrounding areas, or to some extent by capillary action or seepage, being covered it will be starved of rainwater, or water from artificial watering means, falling directly on it. In the case of young trees or plants whose roots may lie entirely below the plant shoe, this can sometimes be a serious drawback. Although in the very flexible types of plant shoe mentioned above, random puddles may well form, there is no guarantee that water from these puddles will reach the soil below the shoe.

It is an object of this invention to provide a plant shoe which is adapted to ensure that water falling directly on the shoe will reach the roots of the plant, whilst inhibiting the growth of weeds around the plant.

Accordingly, the invention provides a plant shoe comprising an opaque web of relatively thin material, having substantially central means for allowing a plant stem to protrude through the web, said means being joined to the periphery of the member by a slit, the web having ribs defining channel means in the web for collecting water and means for passing the water to the soil around the stem, the ribs being such as to stiffen the web whilst allowing sufficient flexibility in the edges of the slit for these edges to be separated so that they can be slipped past the stem to position the shoe around the stem. The stiffening effect of the ribs enables the shoe, when in position around a plant stem, to be relatively undistorted so that it will convey water to the means abovementioned for carrying water to the stem. This latter may consist of means for distributing the water over the area under the shoe, or for conveying it to the base of the stem itself, or both.

Various embodiments of the invention will now be described, by way of example only, with reference to the drawings hereof, in which:–

Figure 1 is a plan view of a plant shoe in a first embodiment;

Figure 2 is a sectional elevation on the line II-II in Figure 1;

Figure 3 is a plan view of a plant shoe in a second embodiment;

Figure 4 is a sectional elevation on the line IV-IV in Figure 3;

in Figure 5, may if desired be provided with holes such as holes 86 (Figure 7) so that some of the collected water is distributed through these holes over the area below the plant shoe whilst any water not passing through the holes 86 is delivered to the base of the plant stem through the openings in the central area 84.

Referring now to Figure 9, a continuous web 90 of longitudinally-corrugated thin, opaque material is formed at regular intervals with transverse lines of perforations 91 or score lines or other lines of weakening enabling square portions 92 to be easily torn or cut from the web. Halfway between each line of weakening 91 and the next the corrugations are flattened in a banjo-shaped zone 93 in which are formed a central hole 11, radial slits 12 extending from the hole 11, and a transverse slit 17 joining the hole 11 to one side edge of the square portion 92. Small drain holes 19 are also formed through the bases of the channels formed by the corrugations.

The web may be formed by rolling or extrusion, as appropriate to the material used, whilst each line of weakening 91 may be formed in a single operation simultaneously with the formation of the flattened zone 93, holes 11 and 19, and slits 12 and 17. In a typical manufacturing operation, plastics material is continuously hot extruded in a strip which is passed through calendering rolls to form the corrugated web 90, which is then passed through a press which forms each area 93 and the associated lines 91, holes and slits, after which the web 90 is coiled to form a roll. The punching and pressing operation being intermittent, sufficient longitudinal distance is allowed between the continuously-running, calendering rolls and the press, and between the press and the coiler, to enable some slack to build up behind the press whilst the web is stationary during operation of the press, and to enable sufficient slack to exist in front of the press to permit the coiler to run continuously. Rotation of the coiler is preferably synchronised with that of the calendering rolls.

The zone 93 need not be flattened if the corrugations are such as to impart sufficient rigidity to the square portion 92 to enable the flaps defined between the radial slits 12, and the edges of the slit 17, to perform their functions as previously described herein, when the portion 92, served along the line 91, is used as a plant shoe.

The plant shoe 92 of Figure 9 is of the same general type as those shown in Figures 1 to 4, viz. it is of the kind which collects water in its channels and distributes the collected water through the holes 19 to the soil beneath the shoe.

Any of the plant shoes described above may be held down to the ground by anchoring with a quantity of soil or turf around the periphery, or (in the case of square shoes) on the flat corner portions. Whilst only circular and square shoes have been described, they may be of any desired shape, for example hexagonal or rectangular.

Plant shoes according to the invention may be of metal, e.g. aluminium, or of plastics (either unreinforced or reinforced with metal or other material), or of moulded paper or similar materials.

In another possible modification, the ribs may be in the form of discrete projections, of pyramidal or other form, so that the channels consist of a network of many channels defined between the discrete projections.

CLAIMS

1. A plant shoe comprising an opaque web of relatively thin material, having substantially central means for allowing a plant stem to protrude through the web, said means being joined to the periphery of the member by a slit, the web having ribs defining channel means in the web for collecting water and means for passing the water to the soil around the stem, the ribs being such as to stiffen the web whilst allowing sufficient flexibility in the edges of the slit for these edges to be separated so that they can be slipped past the stem to position the shoe around the stem.

2. A plant shoe according to Claim 1 wherein the channel means includes at least one channel at least partly surrounding the central means.

3. A plant shoe according to Claim 2, wherein said at least one channel is arcuate or circular and substantially concentric with the central means.

4. A plant shoe according to Claim 3 wherein the arcuate or circular channels are interconnected by at least one further channel directed towards the central means.

5. A plant shoe according to any one of the preceding claims, wherein the channel means are perforated at intervals so as to distribute collected water over the area covered by the shoe.

6. A plant shoe according to any one of the preceding claims, wherein the channel means are so arranged as to convey collected water to the central means so that said water can pass therethrough to the base of the stem.

7. A plant shoe according to any one of the preceding claims, wherein the web comprises a substantially planar upper portion from which the ribs depend downwardly, the channel means comprising pairs of said ribs joined at their base.

8. A plant shoe according to any one of Claims 1 to 6, wherein at least the greater part of the web is of corrugated form.

9. A plant shoe according to Claim 8, wherein the web comprises at least one corrugated portion defining first said channels which terminate in at least one second channel for collecting water from the first channels, the or each second channel terminating in the central means.

10. A plant shoe according to Claim 9, wherein the first channels are arcuate and the or each second channel, fed thereby, is radial.

11. A plant shoe according to Claim 9 or Claim 10, wherein the or each second channel slopes downwardly towards the central means, the depth of the corrugations decreasing away from the central means so that the tops of the ribs defining the corrugations lie substantially in a common horizontal plane whilst the bottoms of the channels are at the level at which they join the second channel or channels.

12. A plant shoe according to Claim 6 when dependent on Claim 2, wherein the ribs comprise at least one pair of ribs defining between them a spiral

channel terminating in the central means.

13. A plant shoe according to Claim 12, wherein the or each spiral channel increases in depth in the direction towards the central means.

14. A plant shoe according to any one of the preceding claims wherein the central means consists of a hole with radial slits extending from the hole.

15. A plant shoe constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in, Figures 1 and 2 of the drawings hereof.

16. A plant shoe constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in, Figures 3 and 4 of the drawings hereof.

17. A plant shoe constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in, Figures 5 and 6 of the drawings hereof.

18. A plant shoe constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in, Figures 7 and 8 of the drawings hereof.

19. A plant shoe constructed, arranged and adapted to operate substantially as hereinbefore described with reference to, and as illustrated in, Figure 9 of the drawings hereof.

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